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This report documents progress made in the period 29 September 1992 and 28 September 1993, on the project described in our proposal "A Complete Public Archive for the Einstein IPC," which was approved under the Astrophysics Data Program last year. All of the principal first-year objectives were archieved and we expect to continue our efforts over the next two years toward the goal of transfering the entire activity to the HEASARC.

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This report documents progress made in the period 29 September 1992 and 28 September 1993 on the project described in our proposal "A Complete Public Archive for the *Einstein* IPC," which was approved under the Astrophysics Data Program last year. All of the principal first-year objectives were achieved and we expect to continue our efforts over the next two years toward the goal of transfering the entire activity to the HEASARC.

Just before the (delayed) start of the grant period, we discovered (through the grapevine rather than via direct communication from SAO) that the basic database with which we, and all other community users, had been working for the past 6-7 years was corrupted by the misapplication of the Gain-Normalized Image (GNI map). The GNI map is used to apply spatially dependent gain changes as measured during ground calibration to the conversion of PHA to PI bins; i.e., from a count's recorded pulse height to a gain-corrected energy. Ever since a reprocessing in the mid 1980's, the GNI map had been applied to all images in celestial, rather than detector, coordinates. Since the transformation is a simple rotation about the field center, on-axis sources (most targets) are unaffected, but all off-axis sources have had essentially random gain corrections applied. The basic dataset we obtained several years ago from SAO was thus corrupted. Thus, our plan simply to transfer the database from the optical disk storage unit on which it resided to a new magnetic disk storage facility on a Sparcstation was not so simple.

Nonetheless, we acquired the requisite hardware and transferred the corrupted data. We then spent some months deciding how best to correct the data. In fact, we already had in hand an energy channel by energy channel set of flatfields which had been derived from the complete mission dataset. Using the diffuse background as a source of illumination, then, we had what amounts to a map of spatial gain variations from actual flight data which had a higher angular resolution ($30''$ instead of the $3'$ of the GNI image) and better statistics than the ground calibration data. The two images are displayed in Figure 1. Figure 1a is the standard GNI map. Figure 1b is an image of the hardness ratio of all fields with discrete sources excised

and with the nominal gain for each observation applied to convert from PHA to PI bins. It is clear that the same gross features are present, AND that the higher resolution image contains real structure that is washed out in the ground calibration data.

However, using the sky data as is to correct the individual images entails the assumption that the diffuse background has the same spectrum everywhere which is not correct. (It also requires the development of a transformation from diffuse flux hardness ratio to PHA bin correction factor.) Our ultimate decision was to add yet further flexibility to our system by allowing the user to apply either the standard GNI image, the inflight-derived image we constructed, or some as yet nonexistent correction (such as one that could be made from, for example, high latitude, low $N_{\rm H}$ fields only). This option was coded, tested, and is now part of the standard `OpEd` software.

With the entire dataset online, processing time for a simple run though the whole database (e.g., finding all sources in a given energy band) was reduced to approximately 8 hours. This allowed us to install a further enhancement which we had wanted to do in earlier versions but which made large processing jobs too slow: we increased the resolution of the images and the source searching and extraction algorithms from $64''$ to $32''$. Since the 1 sigma width of the IPC PSF is $\sim 40''$, this resolution provides for all but the brightest handful of sources the most accurate fluxes and positions derivable. It also matches the resolution of the flatfielding algorithm. Tests showed that it also improved the reliability of detected sources below the $3.5\,\sigma$ threshold.

Other activities included various refinements to the source search algorithm for both point and extended sources, the validation of the flatfield hypercube, and extensive work on documenting new and existing code. We also spent considerable time in investigating ways to optimize the extended source search and to develop reliability criteria with which to annotate the two-sigma catalogs. These latter acrtivities are continuing in the current year which will see the publication of both

the final $2\,\sigma$ catalogs in various bands along with the extended source results. The Burst Catalog is complete. Rudimentary image display capability was also added to the system to allow the user to have a quick look at, for example, the source-subtracted image without exiting to a standard image analysis system.

As part of the plan to transfer this activity after year three of the grant to the HEASARC, we also established contact with the Center, primarily through the auspices of a former Columbia graduate student who worked extensively with the `OpEd` package and is now a HESEARC employee. We are pleased to note that the OGIP Director has declared that the system architecture and philosophy for the *ASCA* analysis package (`XSELECT + FTOOLS`) is based in large part on the *Einstein* `OpEd` system we have developed. Thus, while the exact form in which the transfer of the database and analysis system will take place is as yet undefined, we are confident that the HEASARC is the correct final repository for the catalogs, database, and software system we are producing and will complete the transfer prior to the expiration of the current *ADP* contract.

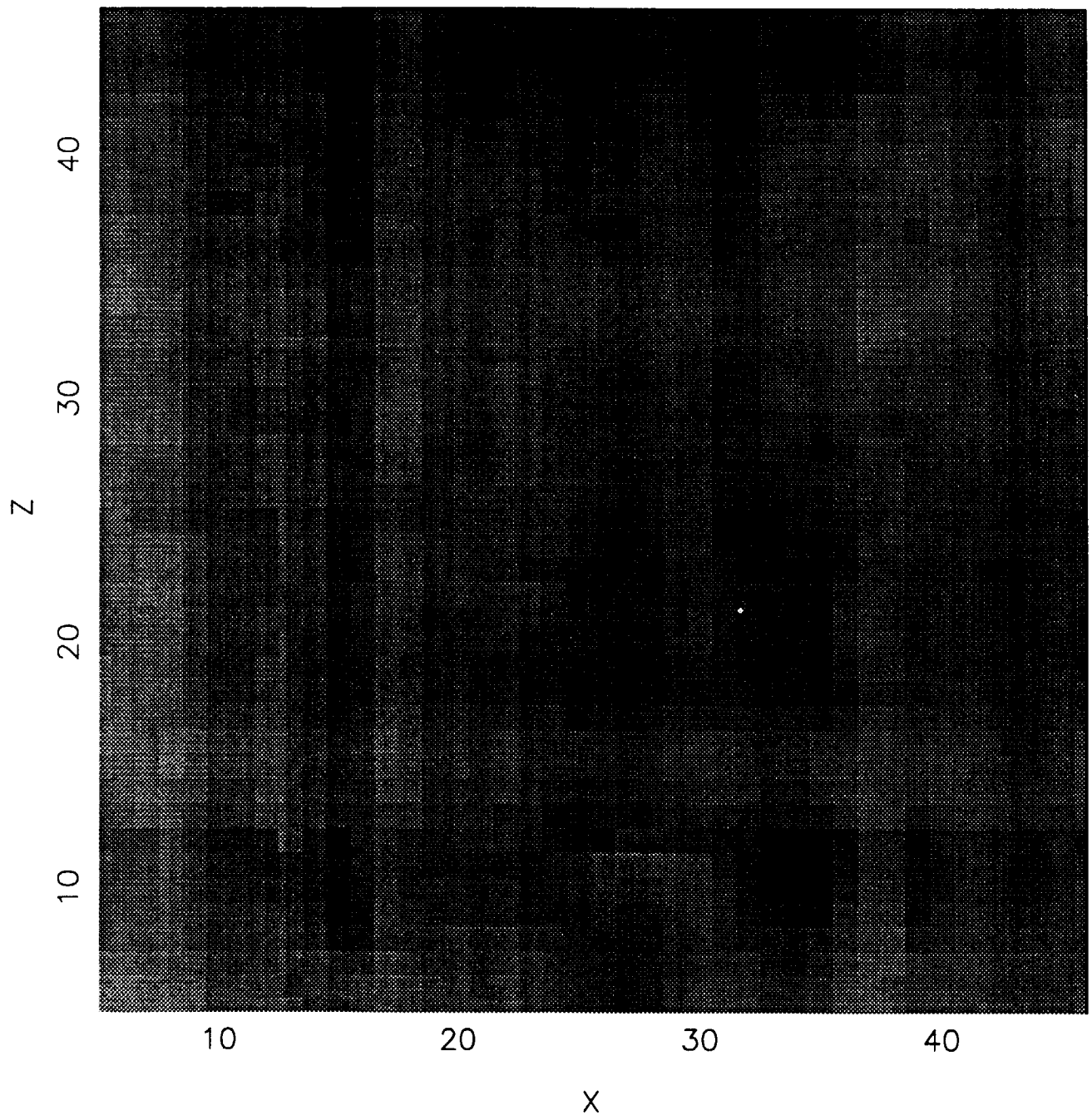

Fig. 1a

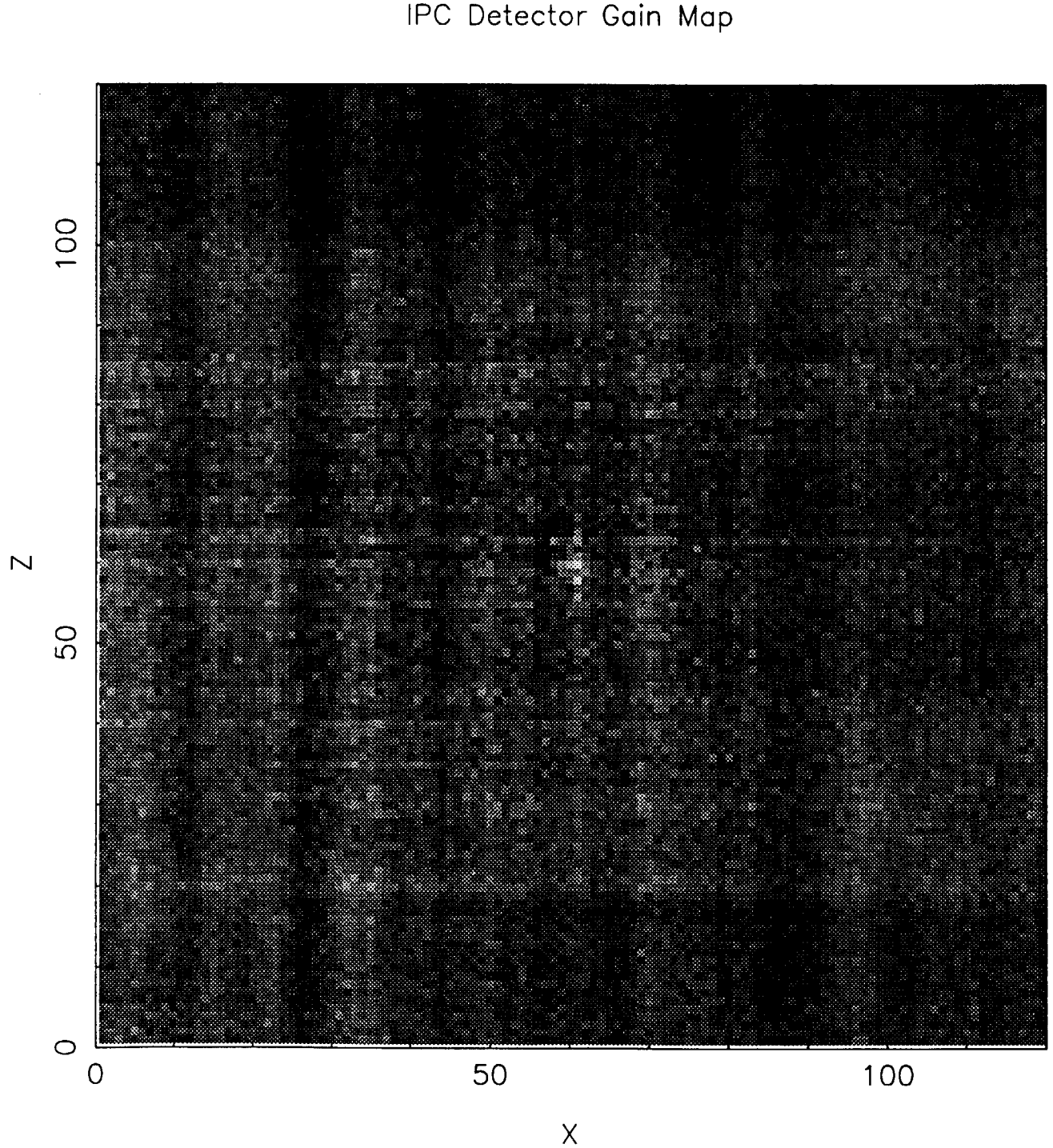

Fig. 1b